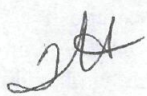


DEPARTMENT OF ECOLOGY
MEMORANDUM

April 29, 2003

TO: Jill Walsh

FROM: Tammy Hall, L.H.G. 

SUBJECT: Hydrogeology pertaining Application No. G2-28430

This Application requests water for multiple domestic supply at a rate of 300 gallons per minute (gpm) from Stroh Water Company Well 5. The applicant is Stroh Water Company, a water purveyor that serves customers on the Gig Harbor Peninsula west of Gig Harbor within the Kitsap Water Resource Inventory Area (WRIA) 15.

General Area Hydrogeology

The following information was compiled from the following resource materials:

- Garling and Molenaar, 1965, *Water Resources and Geology of the Kitsap Peninsula and Certain Adjacent Islands*, USGS Water Supply Bulletin No. 18.
- Drost, 1982, *Water Resources of the Gig Harbor Peninsula and Adjacent Areas, Washington*, USGS Open File Report 81-1021.
- Sweet-Edwards/ EMCON, Inc., 1992, *Gig Harbor Peninsula Ground Water Management Plan, Task 5 Hydrogeologic Evaluation Report*, prepared for the Tacoma-Pierce County Health Department.

The Gig Harbor Peninsula lies within the southern half of the Puget Sound lowland between the central Cascade Range to the east and the southern Olympic Mountains to the west. The Puget Lowland is part of a large glacial drift plain formed by multiple glaciations that occurred in the region. A complex sequence of unconsolidated and partially consolidated sediments beneath the area was created by a series of glacial advances and recessions. Deposits were also left by streams and lakes during these same periods of time. The thickness of the glacial and interglacial deposits in the area is not known. The deepest wells in the area have been drilled in excess of 1,000 feet below ground surface (bgs).

The unconsolidated glacial and interglacial deposits are up to 2 million years old. The most recent glaciation in the region ended approximately 13,500 years ago and is known as the Vashon Stage of the Fraser Glaciation. Vashon glacial deposits are characterized by a sequence of recessional outwash, lodgement till and other ice contact deposits, and advance outwash deposits. The upland areas of the Gig Harbor Peninsula are mantled with glacial till. Glacial outwash and recent alluvium cover the valleys. Localized areas of recessional outwash overlies till at a few locations.

The typical glacial sequence consists of the following types of deposits, which are listed youngest (closest to the surface) to oldest (deepest):

- Recessional outwash deposits. Recessional outwash was deposited by meltwater streams flowing from the glacier as it receded. As a result, these deposits are generally poorly sorted sand and gravel, which often



may include cobbles and boulder-sized materials. Recessional outwash generally becomes finer grained upward within the unit. Recessional outwash deposits exhibit moderate to high permeabilities. Recessional outwash deposits typically serve as aquifers.

- Glacial Till. These deposits are typically poorly sorted and predominately consist of silty sand and gravel, but may also contain boulders. Till was deposited directly by the glacier as a result of grinding and compaction and behave as confining units that impede groundwater flow. Drillers' logs refer to tills as hardpan.
- Advance outwash deposits. Advance outwash was deposited by the advancing glacier by streams and is similar in characteristics to recessional outwash. These deposits typically consist of well graded sand and gravel and generally become finer grained with depth. Although the deposits are permeable, some portions are often dense and compacted as a result of the over riding glacial ice. Advance outwash deposits can typically serve as aquifers.

The alternating glacial and non-glacial periods of deposition created numerous aquifers and aquitards. Several aquifers and aquitards have been identified on the Gig Harbor Peninsula. The principal aquifers include locally occurring perched water zones, the Upper Aquifer, the Sea Level Aquifer; and at least two deep aquifer systems below the Sea Level Aquifer. One principal aquitard commonly separates the Upper Aquifer from the Sea Level Aquifer (EMCON, 1992).

Perched groundwater occurs primarily in localized areas where impervious layers prevent or retard the downward percolation of groundwater. Perched water zones commonly occur in pockets of permeable material within the till. Wells sited in perched zones are relatively shallow and characterized by water levels significantly above those in the Upper Aquifer. Water withdrawal from wells sited in perched zones is limited to single domestic supply due to the low production capacities of the wells.

The Upper Aquifer is composed of a poorly sorted gravel, sand, silt, and clay. The Upper Aquifer is encountered between 0 and 250 feet above mean sea level (msl) and is generally 50 feet thick, although it can be up to 200 feet in localized areas (EMCON, 1992).


Separating the Upper Aquifer from the Sea Level Aquifer is a unit of low permeability that retards groundwater flow between the two aquifer units. The unit is generally fine-grained and has been identified as the Kitsap Formation (Garling and Molenaar, 1965). It can be up to 200 feet in thickness but may be completely absent in some areas and is encountered from 200 above msl to 100 feet below msl (EMCON, 1992).

The Sea Level Aquifer is composed of sand and gravel and is a major source of groundwater in the Gig Harbor Peninsula. The Sea Level Aquifer can be as thick as 250 feet and is encountered between 150 feet above msl to 150 feet below msl (EMCON, 1992).

In the Gig Harbor area, both the Upper and Sea Level aquifers are recharged almost exclusively from precipitation. Hydraulic connections between these aquifers and other mainland aquifers are limited by topography. Groundwater from the Upper and Sea Level Aquifers discharges to deeper aquifers, surface streams and lakes, and marine water.

Hydrologic analysis

Stroh Water Company Well 5 is located off Filmore Road, in the Gateway area of south Gig Harbor. The well log indicates Well 5 is 8 inches in diameter, has a completed depth of 317 feet, and is screened from 312 to 319 feet below ground surface (bgs). The well log indicates drilling through three sequences of sand, gravel, and hardpan (glacial till) before reaching a brown sand and gravel layer at a depth of 308 feet bgs. The surface elevation at the well site is approximately 300 feet above msl. Stroh Water Company also operates Well 4 which is 27 feet north of Well 5, at the same site location. Well 4 is completed at a similar depth as Well 5.



A geologic cross section provided in EMCON (1992) transects an area immediately west of Stroh's Well 5 and utilizes Stroh Water System Well 2. Well 2 is 316 feet deep and has a static water level of approximately 36 above msl. Based on interpretation provided in EMCON (1992), Stroh Well 2 is drawing water from the Sea Level Aquifer. Because Wells 4 and 5 are completed at similar depths as Well 2, report drilling through similar lithologies, and have comparable static water levels, Wells 4 and 5 are also likely are sited in the Sea Level Aquifer. Groundwater at this location is discharging to marine water.

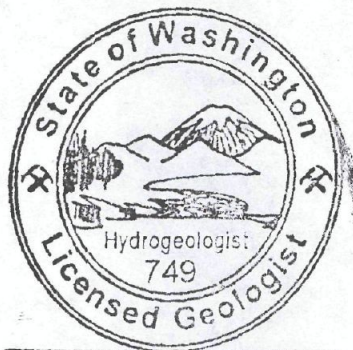
A 24-hour pump test was conducted on Well 5 February 12 and 13, 1992. The results of the pump test are summarized in correspondence from Robinson & Noble (R&N) to Mike Ireland (Harbor Water Co., Inc) dated March 6, 1992. Well 5 was pumped at a rate of approximately 239 gpm, Well 4 was used as an observation well. The specific capacity of Well 5 after 24 hours was calculated at 6 gpm per foot (gpd/ft) of drawdown. The recovery data from Well 5 implies a transmissivity of 200,000 gpd/ft; however, the observation well (Well 4) recovery data implies a somewhat lower transmissivity of 110,000 gpd/ft. The results of the pump test indicate that the well is capable of producing 300 gpm with a projected pumping level of 246 feet bgs (54 feet above msl) after pumping continuously for 100 days. Interference drawdown from Well 4 pumping 220 gpm is anticipated to be less than 9 feet after the same period of time. A pumping water level 256 feet (44 feet above msl) in Well 5 is indicated after 100 day continuous pumping at a rate of 300 gpm if Well 4 is pumping 220 gpm. (R&N, 1992)

Seawater Intrusion

Information regarding seawater intrusion in coastal wells in Pierce County indicate that chloride levels are relatively low, generally ranging from 1 to 6 milligrams per liter (mg/l); however several wells in the Raft Island and Horseshoe Bay areas show evidence of saltwater intrusion (EMCON, 1992). Nearshore wells in the general area of the proposed withdrawal; however, have relatively low chloride concentrations (Dion, N.P and Sumioka, S.S., 1984, *Seawater Intrusion into Coastal Aquifer in Washington, 1978*, , US Geologic Survey Water-Supply Bulletin 56) (EMCON, 1992).

The withdrawal location is located on the Gig Harbor Peninsula, situated approximately halfway between the Narrows to the east and Willochet Bay to the west. Although the non-pumping (static) water level of Well 5 is above sea level, the pumping water level is near sea level, making seawater intrusion a potential concern. However, since the well is located more than one mile from marine water and nearshore wells do not show evidence of seawater intrusion, the risk of seawater intrusion at this location can be considered fairly low.

Tammy L. Hall
Licensed Hydrogeologist



TAMMY L. HALL

RECEIPTReceipt Number **04-007992**

Department of Ecology

(4610)

Manual Receipt

PO Box 5128

Lacey, WA 98509-5128

(360) 407-7095

Current Document Number **461H0572CJ**Date **10/20/2003**FM **04**

Remitter Name

STROHS WATER COMPANY INC

Receipt Name

Check/Draw Number **8656**Document Amount **\$5.00**Method of Payment **Check**Comment Description **WATER RIGHTS**

Ref Doc Nr	Ref Doc Sfx	Inv Nr	Id Nr	Sub Id Nr	Prgm Cd	T C	R	Fund	Maj Grp	Maj Src	Sub Src	Cnty	Work Cls	PIC	AI	Org	Prj	Sub Prj	Prj Phs	Sub Obj	Sub Obj	Var GL	Sub Sid Dr	Sub Sid Cr	Alloc Amt
								H00	001			001	02	85											\$5.00

21.⁰⁰ check
to auditor returned
to stroh - not
ready for cert.

10/30/03

\$5.00 receipt
can be applied
to future extensions
or certificate.

SC

10/30/03



STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

July 24, 2003

Stroh Water Company
3408 Hunt Street
Gig Harbor WA 98335-2038

Dear Sir or Madame:

Re: Ground Water Permit No. G2-28430

Enclosed is Permit No. G2-28430. Our information indicates that your system has been completed.

Also enclosed is a Proof of Appropriation form, which is to be filed when the water has actually been put to full beneficial use. You must contact this office if you cannot put the water to full beneficial use by **June 1, 2012**. Please read the enclosed information sheet, as well as both sides of your permit.

The statutory recording fees are to be sent in as two separate remittances in the form of checks or money orders. Cash will NOT be accepted. Send both remittances to the Department of Ecology.

\$5.00 payable to the Department of Ecology

AND

\$21.00 payable to the Pierce County Auditor

Also, the County Auditor is requiring us to have the parcel number(s) for the point of diversion/withdrawal and the place of use added to your certificate for recording. Please supply these numbers to us and we will forward them to the County Auditor with your certificate for recording.

Sincerely,

A handwritten signature in cursive script that reads "Thomas Loranger".

Thomas Loranger
Water Resources Supervisor
Southwest Regional Office

TL:th (permit3)

